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LEE & HAYES PLLC
421 W RIVERSIDE AVENUE SUITE 500
SPOKANE, WA 99201

| EXAMINER | |
|---|---|
| RAO, ANAND SHASHIKANT | |
| **ART UNIT** | **PAPER NUMBER** |
| 2613 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| *Office Action Summary* | Application No. | Applicant(s) |
|---|---|---|
| | 09/812,713 | ZHANG ET AL. |
| | Examiner | Art Unit |
| | Andy S. Rao | 2613 |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-76* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-76* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

**DETAILED ACTION**

*Drawings*

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

*Specification*

2. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 1-76 are rejected under 35 U.S.C. 102(e) as being anticipated by Shum et al., (US Patent 6,476,805 hereinafter referred to as "Shum").

Shum discloses a method for compressing concentric mosaic image data having a plurality of frames (Shum: column 9, lines 50-67), the method comprising: selectively dividing the plurality frames into a plurality of anchor frames and a plurality of predicted frames (Shum: column 12, lines 30-44); independently encoding the anchor frames (Shum: column 18, lines 40-63); and encoding a prediction residue for each of the predicted frames being determined by referring each of the predicted frames to at least one of the anchor frames (Shum: column 15, lines 15-26; column 40, lines 35-60), as in claim 1.

Regarding claims 2-5, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified. Regarding claims 6-9, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified.

Regarding claims 6-8, Shum discloses segmenting the frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 39-41); segmenting the

frames into a plurality of predicted frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 35-38); and encoding each of predicted frame macroblocks using motion compensation (Shum: column 23, lines 15-26); for each macroblock, searching in at least an area within the image data array near the predicted frame macroblock for a significantly best matching frame macroblock (Shum: column 24, lines 50-68); determining a reference vector for each predicted frame macroblock within each predicted frame as specified (Shum: column 22, lines 10-20); for each predicted frame macroblock, determining a prediction residue for the predicted frame macroblock by the difference between a predicted frame macroblock value and an anchor frame macroblock value (Shum: column 28, lines 10-53); and using motion compensation (Shum: column 31, lines 43-61), as specified.

Regarding claims 9-10, Shum discloses for each predicted macroblock, transforming residue by a DCT (Shum: column 19, lines 35-40); entropy encoding each transformed residue using a Huffman coder (Shum: column 19, lines 5-20), wherein the DCT includes basis 8 DCT (Shum: column 10, lines 60-65) and quantization of DCT coefficients by a quantization scale associated with the plurality of predicted frames (Shum: column 18, lines 1-65), as specified.

Regarding claims 11-13, Shum discloses using a translation based model (Shum: column 22, lines 23-26), an affine motion model (Shum: column 25, lines 50-55), and a perspective motion model (Shum: column 10, lines 1-5), as in the claims.

Regarding claims 14-15 and 17-18, Shum discloses outputting a bitstream (Shum: column 11, lines) that includes encoded anchor frame data (Shum: column 12, lines 39-41), encoded predicted frame data (Shum: column 12, lines 35-38), encoded anchor frame data associated with an anchor macroblock group and corresponding indexing data (Shum: column

13, lines 10-15), indexing data, (Shum: column 13, lines 10-15), and quantization scale information (Shum: column 18, lines 40-64), as specified.

Regarding claim 16, Shum discloses that the bitstream discloses a thumbnail image of a least a portion for the concentric mosaic data (Shum: column 34, lines 39-55), as in the claim.

Regarding claims 21-22, Shum discloses that the encoded predicted frame data is further configured to identify encoded predicted frame macroblock groups (Shum: column 13, lines 10-15), as in the claims.

Shum discloses a computer readable medium (Shum: column 7, lines 20-37; column 8, lines 5-23) having computer executable instructions (Shum: column 9, lines 10-20) for compressing concentric mosaic image data having a plurality of frames (Shum: column 9, lines 50-67), the method comprising: selectively dividing the plurality frames into a plurality of anchor frames and a plurality of predicted frames (Shum: column 12, lines 30-44); independently encoding the anchor frames (Shum: column 18, lines 40-63); and encoding a prediction residue for each of the predicted frames being determined by referring each of the predicted frames to at least one of the anchor frames (Shum: column 15, lines 15-26; column 40, lines 35-60), as in claim 23.

Regarding claims 24-27, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines

60-65), as specified. Regarding claims 6-9, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified.

Regarding claims 28-30, Shum discloses segmenting the frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 39-41); segmenting the frames into a plurality of predicted frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 35-38); and encoding each of predicted frame macroblocks using motion compensation (Shum: column 23, lines 15-26); for each macroblock, searching in at least an area within the image data array near the predicted frame macroblock for a significantly best matching frame macroblock (Shum: column 24, lines 50-68); determining a reference vector for each predicted frame macroblock within each predicted frame as specified (Shum: column 22, lines 10-20); for each predicted frame macroblock, determining a prediction residue for the predicted frame macroblock by the difference between a predicted frame macroblock value and an anchor frame macroblock value (Shum: column 28, lines 10-53); and using motion compensation (Shum: column 31, lines 43-61), as specified.

Regarding claims 31-32, Shum discloses for each predicted macroblock, transforming residue by a DCT (Shum: column 19, lines 35-40); entropy encoding each transformed residue using a Huffman coder (Shum: column 19, lines 5-20), wherein the DCT includes basis 8 DCT

(Shum: column 10, lines 60-65) and quantization of DCT coefficients by a quantization scale associated with the plurality of predicted frames (Shum: column 18, lines 1-65), as specified.

Regarding claim 33, Shum discloses using a translation based model (Shum: column 22, lines 23-26) as in the claim.

Regarding claims 34-37, Shum discloses outputting a bitstream (Shum: column 11, lines) that includes encoded anchor frame data (Shum: column 12, lines 39-41), encoded predicted frame data (Shum: column 12, lines 35-38), encoded anchor frame data associated with an anchor macroblock group and corresponding indexing data (Shum: column 13, lines 10-15), indexing data, (Shum: column 13, lines 10-15), and quantization scale information (Shum: column 18, lines 40-64), as specified.

Regarding claims 38-39, Shum discloses that the encoded predicted frame data is further configured to identify encoded predicted frame macroblock groups (Shum: column 13, lines 10-15), as in the claims.

Regarding claims 31-34, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified.

Regarding claims 35-37, Shum discloses segmenting the frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 39-41); segmenting the

frames into a plurality of predicted frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 35-38); and encoding each of predicted frame macroblocks using motion compensation (Shum: column 23, lines 15-26); for each macroblock, searching in at least an area within the image data array near the predicted frame macroblock for a significantly best matching frame macroblock (Shum: column 24, lines 50-68); determining a reference vector for each predicted frame macroblock within each predicted frame as specified (Shum: column 22, lines 10-20); for each predicted frame macroblock, determining a prediction residue for the predicted frame macroblock by the difference between a predicted frame macroblock value and an anchor frame macroblock value (Shum: column 28, lines 10-53); and using motion compensation (Shum: column 31, lines 43-61), as specified.

Regarding claims 38-39, Shum discloses transforming residue by a discrete cosine transform (Shum: column 19, lines 30-49); entropy encoding each transformed residue using a Huffman encoder and quantizing by a quantization scale (Shum: column 19, lines 60-65), as specified.

Shum discloses an apparatus (Shum: figure 3), comprising: a memory (Shum: column 7, lines 60-67; column 8, lines 1-20) suitable for storing concentric image data having a plurality of frames (Shum: column 9, lines 50-67); logic operatively coupled to the memory (Shum: figure 3, element 221) and configured to selectively divide the plurality frames into a plurality of anchor frames and a plurality of predicted frames (Shum: column 12, lines 30-44); independently encode the anchor frames (Shum: column 18, lines 40-63), and encode a prediction residue, the prediction residue for each of the predicted frames being determined by referring each of the

predicted frames to at least one of the anchor frames (Shum: column 15, lines 15-261 column 40, lines 35-60), as in claim 40.

Regarding claims 41-45, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified. Regarding claims 6-9, Shum discloses segmenting the anchor frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58), independently coding each of the anchor frame macroblocks (Shum: column 12, lines 39-41), dividing the macroblocks into subblocks containing luminance and chrominance information (Shum: column 10, lines 60-67), transforming the subblocks by a DCT operation (Shum: column 19, lines 30-49), quantizing the subblocks and entropy encoding the transformed quantized subblocks (Shum: column 19, lines 60-65), as specified.

Regarding claims 46-47, Shum discloses segmenting the frames into a plurality of anchor frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 39-41); segmenting the frames into a plurality of predicted frame macroblocks (Shum: column 10, lines 53-58; column 12, lines 35-38); and encoding each of predicted frame macroblocks using motion compensation (Shum: column 23, lines 15-26); for each macroblock, searching in at least an area within the image data array near the predicted frame macroblock for a significantly best matching frame macroblock (Shum: column 24, lines 50-68); determining a reference vector for each predicted

frame macroblock within each predicted frame as specified (Shum: column 22, lines 10-20); for each predicted frame macroblock, determining a prediction residue for the predicted frame macroblock by the difference between a predicted frame macroblock value and an anchor frame macroblock value (Shum: column 28, lines 10-53); and using motion compensation (Shum: column 31, lines 43-61), as specified.

Regarding claims 48-49, Shum discloses for each predicted macroblock, transforming residue by a DCT (Shum: column 19, lines 35-40); entropy encoding each transformed residue using a Huffman coder (Shum: column 19, lines 5-20), wherein the DCT includes basis 8 DCT (Shum: column 10, lines 60-65) and quantization of DCT coefficients by a quantization scale associated with the plurality of predicted frames (Shum: column 18, lines 1-65), as specified.

Regarding claim 50, Shum discloses using a translation based model (Shum: column 22, lines 23-26), as in the claim.

Regarding claims 51-54, Shum discloses outputting a bitstream (Shum: column 11, lines) that includes encoded anchor frame data (Shum: column 12, lines 39-41), encoded predicted frame data (Shum: column 12, lines 35-38), encoded anchor frame data associated with an anchor macroblock group and corresponding indexing data (Shum: column 13, lines 10-15), indexing data, (Shum: column 13, lines 10-15), and quantization scale information (Shum: column 18, lines 40-64), as specified.

Regarding claims 55-56, Shum discloses that the encoded predicted frame data is further configured to identify encoded predicted frame macroblock groups (Shum: column 13, lines 10-15), as in the claims.

Shum discloses a method for decompressing a bitstream (Shum: column 18, lines 35-40; column 14, lines 52-60: "codec") having encoded anchor frame data (Shum: column 12, lines 39-41), encoded predicted frame data (Shum: column 12, lines 35-38), and indexing data (Shum: column 13, lines 10-15) associated with a compressed image data array having image data associated with a plurality of frames (Shum: column 9, lines 50-67), the method comprising: accessing the index data to identify: a unique location for each encoded anchor frame within the encoded anchor frame data (Shum: column 26, lines 42-67; column 27, lines 1-45) and from each encoded anchor frame each encoded anchor macroblock therein (Shum: column 10, lines 55-67); a unique location for each encoded predicted frame within the encoded predicted frame data (Shum: column 26, lines 42-67; column 27, lines 1-45) and from each encoded predicted frame each encoded predicted frame macroblock therein (Shum: column 10, lines 55-67); for each view to be rendered, determining which encoded anchor frame macroblock group and encoded predicted frame macroblock group are to be used in rendering the new view (Shum: column 34, lines 23-39); selectively decoding the encoded anchor frame macroblock to be used in the new view and selectively decoding the predicted frame macroblock using all referenced decoded anchor frame macroblock group for the predicted frame macroblock (Shum: column 34, lines 3-15), as in claim 57.

Regarding claims 58-59, Shum discloses determining if the encoded anchor frame macroblock or encoded predicted frame macroblock group has a corresponding decoded anchor frame macroblock group or corresponding decoded predicted frame macroblock group, respectively, and if so, using the corresponding macroblock group in rendering the new view (Shum: column 37, lines 29-57), as the claims.

Regarding claim 63, Shum discloses outputting a bitstream further (Shum: column 11, lines 15-25) includes quantization scale information (Shum: column 18, lines 40-64), as specified.

Regarding claim 64, Shum discloses decoding the encoded macroblock group by an inverse DCT operation (Shum: column 19, lines 30-49) that was quantized (Shum: column 19, lines 60-65) by a quantization scale associated with the plurality of predicted frames (Shum: column 18, lines 43-50), as specified.

Regarding claims 65-66, Shum discloses selectively decoding the encoded anchor frame and predicted frame to be used in rendering the new view (Shum: column 34, lines 1-10) further includes storing decoded anchor frame data in a first memory cache and the decoded predicted frame macroblock group in a second memory cache (Shum: column 7, lines 45-60; column 8, lines 5-23), as in the claims.

Regarding claim 67, Shum discloses rendering the new view on at least one output device (Shum: column 8, lines 35-43), as in the claim.

Shum discloses a computer readable medium (Shum: column 7, lines 20-37; column 8, lines 5-23) having computer executable instructions (Shum: column 9, lines 10-20) for decompressing a bitstream (Shum: column 18, lines 35-40; column 14, lines 52-60: "codec") having encoded anchor frame data (Shum: column 12, lines 39-41), encoded predicted frame data (Shum: column 12, lines 35-38), and indexing data (Shum: column 13, lines 10-15) associated with a compressed concentric mosaic image data having a plurality of frames (Shum: column 9, lines 50-67), the computer executable instructions providing steps comprising: accessing the index data to identify: a unique location for each encoded anchor frame within the

encoded anchor frame data (Shum: column 26, lines 42-67; column 27, lines 1-45) and from each encoded anchor frame each encoded anchor macroblock group therein (Shum: column 10, lines 55-67); a unique location for each encoded predicted frame within the encoded predicted frame data (Shum: column 26, lines 42-67; column 27, lines 1-45) and from each encoded predicted frame each encoded predicted frame macroblock group therein (Shum: column 10, lines 55-67); for each view to be rendered, determining which encoded anchor frame macroblock group and encoded predicted frame macroblock group are to be used in rendering the new view (Shum: column 34, lines 23-39); selectively decoding the encoded anchor frame macroblock group to be used in the new view and selectively decoding the predicted frame macroblock using all referenced decoded anchor frame macroblock group for the predicted frame macroblock group (Shum: column 34, lines 3-15), as in claim 68.

Regarding claims 69-70, Shum discloses determining if the encoded anchor frame macroblock or encoded predicted frame macroblock group has a corresponding decoded anchor frame macroblock group or corresponding decoded predicted frame macroblock group, respectively, and if so, using the corresponding macroblock group in rendering the new view (Shum: column 37, lines 29-57), as the claims.

Regarding claim 71, Shum discloses that each predicted frame includes a prediction residue (Shum: column 28, lines 25-30), as specified.

Regarding claims 72-73, Shum discloses decoding the encoded macroblock group by an inverse DCT operation (Shum: column 19, lines 30-49) that was quantized (Shum: column 19, lines 60-65) by a quantization scale associated with the plurality of predicted frames (Shum: column 18, lines 43-50), as specified.

Regarding claim 74, Shum discloses outputting a bitstream further (Shum: column 11, lines 15-25) includes quantization scale information (Shum: column 18, lines 40-64), as specified.

Regarding claim 75, Shum discloses decoding the predicted frame macroblock group using motion compensation using a prediction residue (Shum: column 28, lines 15-35), as in the claim.

Regarding claim 76, Shum discloses rendering the new view on at least one output device (Shum: column 8, lines 35-43), as in the claim.

## *Conclusion*

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jenkins discloses as system and method of perception based image generation and encoding. Pfister discloses rendering pipeline for surface elements. Shum discloses a stereo reconstruction from multiperspective panoramas. Cabral discloses a reflection space image based rendering. Grzeszczuk discloses hardware accelerated visualization of surface light fields. Li discloses methods and arrangements for compressing image based rendering data using alignment and 3D wavelet transform techniques. Hakura discloses a parameterized animation compression methods and arrangements.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy S. Rao whose telephone number is (703)-305-4813. The examiner can normally be reached on Monday-Friday 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris S. Kelley can be reached on (703)-305-4856. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andy S. Rao
Primary Examiner
Art Unit 2613

ANDY RAO
PRIMARY EXAMINER

asr
April 26, 2004